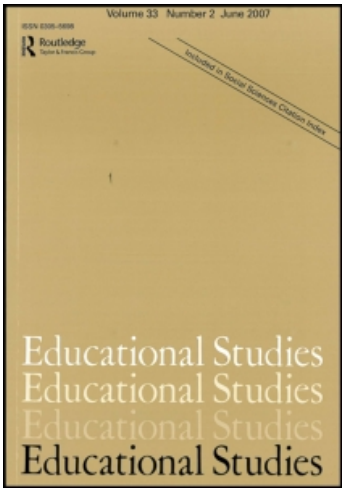

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Collaborative learning in pre-service teacher education: an exploratory study on related conceptions, self-efficacy and implementation

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Collaborative learning in pre-service teacher education: an exploratory study on related conceptions, self-efficacy and implementation

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In this study, the actual position of collaborative learning (CL) in teacher education is examined. One hundred and twenty teacher educators and 369 student teachers are surveyed on general educational beliefs, mental models and conceptions related to CL. The self-efficacy and the implementation of CL are also taken under scrutiny. The results reveal that CL is highly valued as a teaching strategy for primary school children; however, student teachers do not prefer to collaborate themselves during their learning process. Student teachers' self-efficacy towards the use of CL is moderate. Collaborative learning is implemented once in a while in teacher education, and student teachers are not intensively trained in the pedagogical use of CL for their future classroom practice.

Keywords: collaborative learning; pre-service teacher education; conceptions; self-efficacy; teaching behaviour

Introduction

As a consequence of the growing complexity and diversity in society, the formerly dominant focus on knowledge transmission in teaching processes has switched to a social-constructivist approach to teaching and learning (Carlson 1999; de Kock, Sleegers, and Voeten 2005; Leach and Scott 2002; Levin 2000; Roelofs, van der Linden, and Erkens 2000). Active learning and cooperation with peers are central characteristics in this new paradigm. Over the last decade, researchers have become increasingly interested in collaborative learning (CL).

Collaborative learning refers to a teaching strategy in which pupils work actively and purposefully together in small groups, with the aim to enhance both their own and their team mates' learning (Ishler, Johnson, and Johnson 1998). In the literature, a large variety of group learning strategies are called CL. De Wever (2006), Sener (1997) and MacInnerney and Roberts (2004) argue that CL and cooperative learning are often used interchangeably. As the different names imply, some authors point at different characteristics, such as the learners' age (Sener 1997), the philosophical roots (Panitz 1996), the focus of working together (Kirschner, Dickinson, and Blosser 1996; Panitz 1996), the task structure (Curtis and Lawson 2001), and the goal and level of pre-structuring (Strijbos and Martens 2001). However, Strijbos and Martens (2001) and Kirschner (2001) argue that CL and cooperative learning also have a large number of similarities. Moreover, Bruffee (1995) states that cooperative

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learning and CL are two versions of the same thing. Both approaches share a sense of community and share the belief that learning is an active, constructive process (Millis and Cottell 1998). Therefore, some authors see CL as a broader, more general concept covering multiple approaches on peer collaboration, among which for example cooperative learning (De Wever 2006; Meloth and Deering 1999; Millis and Cottell 1998; Palinscar 2002; Rose 2004). We agree with De Wever (2006) and Dillenbourg (1999) who argue that constructive learning contexts are ill-structured and therefore rather collaborative than cooperative. Therefore, in this study we opt for the term 'collaborative learning' which includes a more broad scope of strategies.

Collaborative learning as a promising strategy: implications for teacher education

The current literature on CL indicates that this strategy is well situated in mainstream education (Lopata, Miller, and Miller 2003). Many studies focusing on the pedagogical value of CL indicate positive effects on the cognitive performance and social development of pupils (e.g. Johnson et al. 2001; Lopata, Miller, and Miller 2003; Slavin 1996, 2004; Veenman et al. 2002).

However, the effectiveness of CL in educational practice is largely dependent on the pedagogical behaviour of teachers (Gillies 2006; Gillies and Boyle 2008; Meloth and Deering 1999; Veenman, Kenter, and Post 2000). In preparing teachers for successful implementation of CL, professional development is crucial (Brody and Davidson 1998; Lunenberg and Korthagen 2005). Therefore, a challenging role is reserved for in-service and pre-service teacher education (Cohen, Brody, and Sapon-Shevin 2004; Hornby 2009; Ishler, Johnson, and Johnson 1998; Veenman et al. 2002). Following Murray and Male (2005), the process of implementing CL into teacher education should be situated at two different levels. Teacher educators can implement CL as a teaching strategy in their own lessons (second order education), and in the content of their lessons they can instruct student teachers on how to apply CL in their future classroom practice (first order education). As teachers have a modelling function (Angelides, Stylianou, and Leigh 2007), teacher educators are responsible for modelling the behaviour they expect from their students (Leikin 2004; Loughran 2006). Therefore, new teaching and learning methods associated with the social-constructivist paradigm must be given a prominent role in the education and training of student teachers (Niemi 2002).

Most of the research on CL is carried out in primary or secondary schools and has mainly investigated the impact of CL on pupils' learning processes. Whereas the effectiveness of CL for students is well documented, investigations into teachers' role during CL (Gillies 2004; Meloth and Deering 1999) and studies on CL in the context of teacher education are still under-represented in empirical research (Darling-Hammond and Hammerness 2005). The research that has been carried out in this respect focused largely on the impact of several forms of CL on teachers student' learning process (Bouas 1996; Glass and Putnam 1989; Showers 1985; Watters and Ginns 2000; Wilhelm 1997). Other studies examined the collaborative pedagogical behaviour of senior teachers and its impact on pupils' learning processes (Antil, Jenkins, and Wayne 1998; Ghaith and Yaghi 1997; Gillies 2006; Rich 1990; Shachar and Shmuelevitz 1997) or the effects of in-service staff development (Ishler, Johnson, and Johnson 1998; Krol-Pot 2005; Sharan and Sharan 1987; Veenman et al. 2002). However, little is known about the professional development of pre-service student

teachers regarding the implementation of CL in educational practice. Based on research of Bouas (1996), Veenman et al. (2002) explored the effects of CL (implemented during a pre-service teacher training) on student teachers' willingness and ability to implement CL. However, the current presence of CL in pre-service teacher education colleges was not investigated in both studies. In addition, teacher educators' point of view was not yet taken under scrutiny in former research.

Notwithstanding the influence of social-constructivist theory, research indicates that the implementation of associated educational innovations has been problematic (Fullan 2001; Lunenberg and Korthagen 2003). Baines, Blatchford, and Kutnick (2003) argue that teachers are often reluctant to implement CL, possibly due to a lack of competence and understanding (Gillies 2006; Slavin 1999; Veenman, Kenter, and Post 2000). Since we believe that pre-service teacher education has a challenging role in making new generations of teachers familiar with CL, the present study explores both teachers' personal background characteristics (e.g. familiarity), their beliefs/conceptions and self-efficacy, and the relation of these with the integration of CL in pre-service teacher education. These characteristics have been delineated as potential explanatory variables in relation to the success or failure of implementing educational innovations (Ghaith and Yaghi 1997; Glass and Putnam 1989; Guskey 1988; Rich 1990).

Personal background characteristics

Previous research has indicated that student teachers and teacher educators' background characteristics, such as gender (Donche and Van Petegem 2007) and year of training (Donche, Vanhoof, and Van Petegem 2003), are related to their beliefs about CL and the degree to which they implement CL in practice. Further, Lopata, Miller, and Miller (2003) found that more experienced teachers implement CL more frequently and with greater competence. Other researchers argue that teachers face the problem of 'familiarity' (Geddis and Wood 1997) or 'apprenticeship of observation' (Hammerness 2005). As they have spent many years as students themselves, they have acquired a certain conception of teaching through observation. This teaching conception is often based on their experience with knowledge transmission, with little engagement among pupils in terms of learning from one another (Lunenberg and Korthagen 2005). As a result, innovative instructional strategies are rarely implemented in contemporary education (Tigchelaar et al. 2001).

Beliefs and conceptions

Teachers' educational beliefs can be understood as a set of representations guiding their concept of learning and instruction and their role in that process. Conceptions, on the other hand, are focused on specific topics in the instructional process (Hermans, van Braak, and Van Keer 2008). In terms of educational beliefs and conceptions, three different approaches can be related to the implementation of an innovation.

First, teachers' educational beliefs are found to be linked to actual classroom practice (Eley 2006; Hermans, van Braak, and Van Keer 2008). Different conceptual labels and classifications exist in teacher thinking research, including multi-dimensional conceptualisations (Murray and Macdonald 1997). However, two-dimensional systems distinguishing between teacher-centred and student-centred beliefs are paramount (e.g. Eley 2006; Hermans, van Braak, and Van Keer 2008; Lunenberg and Volman 1999).

The second orientation focuses on the beliefs of students. Vermunt and Van Rijswijk (1997) distinguish five mental models of learning that can be defined as "a coherent system of views on learning and teaching processes, which is decisive for what an individual means by learning, what learning activities he or she considers possible and desirable, which tasks in the teaching-learning process he or she considers his or hers and which tasks are destined for others" (Lunenberg and Volman 1999, 435). Based on Donche, Vanhoof, and Van Petegem (2003), it can be hypothesised that aspirant teachers who attach less importance to cooperative learning for their own learning process are expected to find cooperative learning less valuable for their pupils.

Thirdly, conceptions towards a specific innovation seem to be a differentiating factor in the innovative practice (Abrami, Poulsen, and Chambers 2004). The more familiar and competent teachers become in the use of a teaching strategy, the more positive their attitudes towards it and the more likely they will implement it (Veenman et al. 2002).

Self-efficacy

A crucial aspect in the successful implementation of instructional innovations is the teacher's sense of competence in the application of a teaching strategy. Previous research suggests that the lack of training given to teachers in relation to innovative learning strategies may have a negative influence on their sense of self-efficacy (Abrami, Poulsen, and Chambers 2004; Veenman et al. 2002) and the degree to which they implement educational innovations. On the other hand, Guskey (1986, 1989) argues that a high sense of self-efficacy can either promote or inhibit change in education (Pajares 1997).

Research questions

The present study investigates the beliefs, conceptions and self-efficacy of student teachers and teacher educators, on the one hand, and the relation with the actual implementation of CL in pre-service teacher education, on the other hand. Five research questions are formulated to guide this study:

(1) What are the beliefs/conceptions of student teachers and teacher educators towards education in general and towards CL in particular?
(2) How competent do student teachers and teacher educators feel in implementing CL?
(3) What is the impact of self-efficacy on conceptions towards CL?
(4) How is CL actually implemented in teacher education?
(5) Which factors explain differences in teacher educators' collaborative teaching behaviour?

Method

Participants

In Flanders (Belgium), 21 pre-service teacher education institutes for primary schools were invited by mail and telephone to participate in this study. In total, 16 teacher

education institutes agreed to participate, with 120 teacher educators and 369 student teachers. Seventy per cent of the participating teacher educators were female and 37.5% had a master degree in psychology or educational sciences. Among the participating student teachers, there were 175 first-year (47.5%), 114 second-year (30.9%) and 80 third-year students (21.7%). Out of the total, 87.8% of the students were females, which is consistent with population data values.

Instruments

Two questionnaires were completed anonymously: a paper and pencil version for teacher educators and an online version for student teachers. All data were gathered in the beginning of the academic year 2007–2008.

Beliefs/conceptions related to teaching and learning

Student teachers' and teacher educators' beliefs regarding teaching in general were measured using the Transmissive and Developmental dimensions of the Beliefs About Primary Education Scale (BPES; Hermans, van Braak, and Van Keer 2008). In each subscale, nine items assess the individual's: (1) developmental beliefs about education, i.e. the notion that education should be process-oriented, and (2) transmissive beliefs about education, i.e. the extent to which respondents believe education serves external goals and is outcome-oriented.

Student teachers also filled out the higher education version of the 'Inventory Learning Styles' (ILS; Vermunt and Van Rijswijk 1997). This measure contains 48 items comprising five subscales concerning mental models of learning (intake of knowledge; construction of knowledge; stimulating education; use of knowledge; cooperative learning).

To measure conceptions towards CL, student teachers and teacher educators completed the Cooperative Learning Implementation Questionnaire (CLIQ; Abrami, Poulsen, and Chambers 2004). This scale contains 48 items comprising three subscales (perceived value of innovation; expectancy of success; perceived cost).

All items were measured on five-point rating scales ranging from 1 (totally disagree) to 5 (totally agree).

Self-efficacy

To measure self-efficacy, participants reported their subjective feeling of competence in relation to the instructional use of CL. This self-efficacy measure ('How competent do you feel in implementing CL?') was scored on a five-point Likert scale, ranging from 1 (not competent at all) to 5 (very competent).

Implementation of collaborative learning in (teacher) education

Teacher educators were asked to indicate the extent to which CL is included in the teacher education curriculum. They stated the degree to which: (1) CL is implemented as an instructional strategy during the lessons they teach, and (2) they make their student teachers familiar with the pedagogical use of CL as an instructional strategy. These questions were rated on a five-point Likert scale, ranging from 1 (never) to 5 (highly frequent).

Student teachers rated 20 instructional strategies in terms of the extent to which these are used in their current teacher education. For this measure, the classification of Hoogeveen and Winkels (1996) was used, distinguishing between tuition, interactive strategies, tasks, collaborative strategies and play strategies.

Personal background characteristics

Teacher educators reported their gender, age (measured in eight intervals of five years), certificate orientation (11 categories, e.g. arts, physical education, psychological and educational sciences) and the teacher training institute they were employed at. Further, they also reported the number of years they were lecturing future primary school teachers and their professional development regarding CL. The latter was measured on a five-point Likert scale, ranging from 1 (not at all) to 5 (very frequent) in relation to continuing education activities.

For student teachers, gender, orientation of secondary education (general, arts, technical, vocational), the teacher education institute and students' level (Years 1, 2, 3) were recorded as background variables. To assess their level of familiarity with CL, student teachers were asked to indicate their experience with CL during primary school, secondary school and during each year of teacher education. This was rated on a five-point Likert scale, ranging from 1 (never) to 5 (highly frequent). An example item is: 'To what extent were you introduced to CL during your own primary school time period?'

Data analysis

Internal consistency of the instruments was verified before further data analysis. Given the low internal consistency of student teachers' familiarity with CL, this variable was not further included in the analyses. In terms of the BPES, ILS and CLIQ, internal consistency of most subscales was good (higher than .80), except for the "cost of CL" subscale of the CLIQ, which was between .62 and .68 in both survey versions (Table 1). Following Nunnally (1967), however, a cut-off value of .60 can be considered acceptable. Table 1 shows item examples and the number of items retained after computing Cronbach's alpha.

All data were analysed using SPSS 15.0. Descriptive measures, *t*-tests, and univariate and multivariate analyses of covariance are applied. The reported *F*-values are based on Wilks' lambda.

Results

Beliefs/conceptions related to education and collaborative learning

The first question concerns the beliefs/conceptions of both student teachers and teacher educators in relation to education in general and CL in particular. Table 2 gives an overview of the descriptive results.

General beliefs

The results indicate that student teachers and teacher educators report more developmental than transmissive beliefs about education. However, for teacher educators the standard deviation of their developmental beliefs is 2.86, whereas it is only 1.25 for

Table 1. Beliefs and conceptions: example items and number of items (*N*) for each scale.

	Scales	Student teachers' survey: N	Teacher educators' survey: N	Example items[a]
Hermans et al. 2008	Transmissive dimension	8 (α = .69)	8 (α = .63)	'The main task of a teacher is to pass on knowledge and skills to the pupils'
	Developmental dimension	8 (α = .78)	7 (α = .74)	'Good education is always connected to the personal environment of the pupil'
Vermunt and Van Rijswijk 1997	Intake of knowledge	9 (α = .75)		'I have to learn definitions and other facts by heart'
	Use of knowledge	5 (α = .70)		'What I learn must be useful for solving practical problems'
	Construction of knowledge	9 (α = .72)		'I have to look for connections in the course content'
	Cooperative learning	8 (α = .82)		'I prefer to perform a task together with other students'
	Stimulating education	8 (α = .85)		'A teacher educator has to stimulate and motivate me'
Abrami et al. 2004	Value of CL	18 (α = .88)	18 (α = .89)	'Engaging in cooperative learning enhances students' social skills'
	Expectancy of CL	18 (α = .85)	16 (α = .88)	'I believe I can implement cooperative leaming successfully'
	Cost of CL	6 (α = .62)	7 (α = .68)	'Implementing cooperative learning requires a great deal of effort'

Note: [a]The example items are all selected from the student teachers' survey.

Table 2. Beliefs about teaching and learning in general, and CL conceptions.

		Teacher educators (n = 120)		Student teachers (n = 369)	
		M	*SD*	*M*	*SD*
Hermans et al. 2008	Transmissive beliefs	2.77	1.50	3.28	1.88
	Developmental beliefs	4.02	2.86	3.98	1.25
Vermunt and Van Rijswijk 1997	Intake of knowledge			3.74	1.78
	Use of knowledge			4.06	1.17
	Construction of knowledge			3.63	1.56
	Cooperative learning			3.12	1.13
	Stimulating education			3.41	1.00
Abrami et al. 2004	Expectations of CL	3.49	0.53	3.26	2.00
	Value of CL	3.72	0.48	3.53	2.06
	Cost of CL	2.89	0.51	2.89	1.00

student teachers. This suggests a lower consensus among teacher educators in terms of the content and organisation of good education in primary school education.

Mental models of learning

The results indicate that student teachers prefer the use (M = 4.06) and intake (M = 3.74) of knowledge in their own learning process, which is in contrast to their preference for a developmental orientation for primary school children. Stimulation from teacher educators is considered less important by student teachers (M = 3.41), as is cooperation with other student teachers (M = 3.12). Using paired-samples t-tests, we compared the cooperative learning subscale score with the other mental models of learning. The results indicate that student teachers value cooperative learning as significantly less important for themselves than all other learning strategies (t(487, 181.183) = 2.203; $p < .001$).

Conceptions about collaborative learning

For the CLIQ, the results indicate that both student teachers and teacher educators expect positive results from CL implementation and estimate its value as a teaching strategy as relatively high. Teacher educators have significantly more positive conceptions about CL than their students, i.e. expectations towards CL (t(487, 173.024) = 4.792; $p < .001$) and the value of CL (t(487, 194.966) = 3.786; $p < .001$). The cost of implementing CL is rated rather low to undecided for both student teachers and teacher educators. Regression analysis indicates that the more student teachers prefer CL themselves, the more positive their attitudes towards CL as an instructional strategy for their pupils (F(3, 196) = 7.989; $p < .001$). The preference for the intake of knowledge is negatively related to CL conceptions (F(3, 196) = 3.028; $p < .05$).

Relation between self-efficacy and collaborative learning and teaching

The results of the second research question indicate that both student teachers and teacher educators deem themselves only moderately competent in using CL. Teacher educators estimate their subjective feeling of competence at 3.14 on average (SD = 0.079). For student teachers, self-efficacy in relation to CL is slightly higher (M = 3.66; SD = 0.61). Surprisingly, no differences were found in student teachers' self-efficacy over the three years of teacher training.

As to the third research question, the impact of self-efficacy on conceptions of CL was investigated in a regression analysis. The results indicate that student teachers' sense of competence influences their conceptions about CL ($F(3, 365) = 13.721$; $p < .001$). The more competent student teachers feel in implementing CL, the higher their expectations ($F(1, 369) = 40.631$; $p < .001$) and their perception of the value of CL ($F(1, 369) = 28.281$; $p < .001$). Accordingly, the costs related to implementing CL are rated lower in case of higher self-efficacy ($F(1, 369) = 23.801$; $p < .001$).

For teacher educators, the results indicate that their sense of competence has a significant influence on their CL conceptions ($F(3, 116) = 10.271$; $p < .001$). The higher their self-efficacy, the higher their expectations towards ($F(1, 120) = 30.602$; $p < .001$) and perception of the value of CL ($F(1, 120) = 12.406$; $p < .05$). The cost related to its implementation is rated lower ($F(1, 120) = 10.293$; $p < .05$).

Implementation of CL in teacher education

The fourth research question focuses on the implementation of CL in pre-service teacher education. Table 3 summarises the extent to which CL is used as an instructional strategy during teacher educators' lessons (second order education), and the extent to which teacher educators familiarise their student teachers with the use of CL as an instructional strategy in primary school classes (first order education).

More than half of the teacher educators reported that they use CL as an instructional strategy less than once a month. Student teachers are even less frequently trained in making pedagogical use of CL in their primary school classes. Only 2.5% of the teacher educators integrate this instructional strategy at least once per week during their lessons.

Next to measuring the implementation of CL from the perspective of teacher educators, we also examined the use of CL in teacher education compared to other teaching strategies from student teachers' perspective. The results indicate that while CL is used relatively frequently in teacher education, teacher educators still mostly use traditional teaching methods in their lessons.

Table 3. Level of use of collaborative learning in pre-service teacher education.

	Level of use					
	Never	1 time at the most in a term of 6 months	Several times in a term of 6 months	Several times in a month	Weekly or several times a week	Not known
a	4 (3.3%)	14 (11.7%)	55 (45.8%)	26 (21.7%)	11 (9.2%)	10 (8.3%)
b	19 (15.8%)	26 (21.7%)	42 (35.0%)	12 (10.0%)	3 (2.5%)	18 (15.0%)

Notes: (a) Use of collaborative learning as teaching strategy during lessons in teacher education.
(b) Making student teachers competent in the pedagogical use of collaborative strategy in primary schools.

Differentiating factors in the collaborative teaching behaviour of teacher educators

As to the fifth question, three multivariate analyses were performed exploring the relation between teacher educators' background information, beliefs/conceptions and self-efficacy, on the one hand, and their implementation of CL, on the other. The implementation of CL in teacher education was considered at both first and second order education (Murray and Male 2005). Table 4 gives an overview of the analyses.

The multivariate results of the first analysis indicate that teacher educators' personal background characteristics account for the differences in the implementation of CL in teacher education. Further, male teacher educators appear to use CL significantly more during their lessons than their female colleagues. Furthermore, the more teacher educators become familiar with this teaching strategy in continuing education sessions, the more frequently they use CL during their lessons and the more they pay attention to familiarising student teachers with the pedagogical use of CL.

Furthermore, while general educational beliefs do not explain differences in the implementation of CL, conceptions concerning CL in particular do: the higher the expectations of teacher educators towards CL, the more they apply this instructional strategy and the more they try to make their student teachers familiar with. Teacher educators who reported they value CL highly also reported implementing this teaching strategy to a significantly higher degree.

Table 4. Impact on the implementation of collaborative learning.

	Implementation of CL in teacher education				
	a		b		
	F	*p*	*F*	*p*	*df*
Personal background characteristics					
Gender	14.253	.033*	1.299	.337	(1, 3)
Age	6.057	.084	1.258	.460	(6, 3)
Certificate orientation	5.686	.090	1.817	.339	(9, 3)
Institute	9.588	.044*	2.774	.218	(15, 3)
Years of experience	5.409	.103	.012	.919	(1, 3)
Continuing education	5.120	.026*	5.078	.027*	(1, 90)
Beliefs and conceptions					
BPES					
Transmissive	.384	.537	.131	.718	(1, 88)
Developmental	.656	.420	.067	.796	(1, 88)
CL conceptions					
Value	5.145	.0.26*	.762	.385	(1, 88)
Expectations	17.559	.000*	4.485	.037*	(1, 88)
Cost	.304	.583	.005	.943	(1, 88)
Self-efficacy	.917	.341	.637	.427	(1, 90)

Notes: *p <0.05.
(a) Use of collaborative learning as instructional strategy during lessons in teacher education.
(b) Making student teachers competent in the instructional use of collaborative strategy in primary school classes.

Self-efficacy of teacher educators concerning implementing CL, however, does not significantly influence the degree of implementation itself.

Discussion

The aim of this study was to investigate the presence of CL in Flemish pre-service teacher education.

The first research question addressed the beliefs and conceptions of both teacher educators and student teachers towards education in general and CL in particular. In contrast with the findings of Lunenberg and Korthagen (2005), both groups favour a developmental orientation towards education for primary school children. However, the study of Lunenberg and Korthagen (2005) differed from ours since it was based on qualitative data from a limited number of teacher educators and senior teachers. Similar to the findings of Veenman et al. (2002) that student teachers in the Netherlands appreciate the educational value of CL for pupils, this instructional strategy is also well accepted in Flanders. In terms of the mental models of learning, the results of this study indicate that student teachers prefer the use and intake of knowledge in their own learning process, supporting the findings of Donche, Vanhoof, and Van Petegem (2003). However, the mental models that student teachers selected for themselves are in contrast with their conceptions about CL for pupils. The results further indicate that CL as learning strategy for pre-service student teachers is valued lower than all other learning strategies. It might be hypothesised that many of these students may have had negative experiences with CL, due to problems like the free-rider effect, an unequal division of work or an inappropriate application (e.g. Lopata, Miller, and Miller 2003). Student teachers' lack of interest in collaborating with one another has two main implications. First, when student teachers are not willing to collaborate with colleagues, innovations in educational settings will be more difficult to introduce according to Swafford (1998) and Meirink (2007). Second, similar to teacher educators, school teachers are responsible for modelling the behaviour they expect from their pupils (Leikin 2004; Loughran 2006). In this respect, Russell (1997) argues that pupils and students are not so much influenced by what they read in books or what teachers tell them, but rather by what they see. When teachers are not open to collaborate with colleagues, they will pass this attitude on to their pupils.

The second and third questions concern the state-of-the-art of self-efficacy in relation to CL. Although student teachers and teacher educators reported only a moderate sense of competence, we found that higher self-efficacy was related to more positive conceptions towards CL for primary schools. This is in line with the findings of Veenman et al. (2002), who concluded that student teachers had more positive opinions about an innovative teaching strategy after a pedagogical training, i.e. their subjective feeling of competence increased because they gained experience with CL in educational practice. Therefore, professional development appears to be valuable for the competency development of both student teachers and teacher educators.

Our results indicate, however, that student teachers' year of training has no influence on their self-efficacy. Across the three years of teacher education, student teachers' self-efficacy scores in terms of the implementation of CL were not significantly different. In this respect, it can be argued that teacher education should pay more attention to student teachers' professional development with regard to CL.

The results of the fourth research question support this argument. While teacher educators reported positive conceptions towards CL, this teaching strategy was not as frequently implemented in practice as other strategies. The results indicate that teacher educators pay limited attention to instructing student teachers on how they can implement CL in primary school. As a consequence, student teachers may face the problem of using theoretical information on this innovative strategy in first order educational practice (Tigchelaar et al. 2001). Further research should explore whether paying more attention in teacher education to the implementation of CL can increase the self-efficacy of student teachers.

The last research question focused on explanatory variables in relation to the implementation of CL by teacher educators. Contrary to the findings of Donche and Van Petegem (2007), we found that male teacher educators apply CL more often than their female colleagues. Geddis and Wood (1997) delineated several constraints to the implementation of innovative teaching strategies, such as the lack of instructional time. However, in the present study the costs of implementing CL were estimated as rather low and were not good predictors of the degree of implementation of CL. Furthermore, previous research suggests that the reason for the limited implementation of CL in teacher education is due to a lack of competence in teacher educators (Tigchelaar et al. 2001). Further research is needed to explore the differential impact of professional development activities on the degree to which CL is implemented in teacher education.

Some limitations of the present study should be acknowledged. First, the questionnaire related to familiarity with CL during compulsory education required that student teachers have a clear memory of this period. Those who could not remember this period well could indicate a 'no answer' option (Billiet 1991); however, it has turned out that the answers were insufficiently consistent. A second limitation concerns the interpretation of the concept 'CL'. While a definition was provided in the questionnaire, some participants may not have read this, which may influence their answers. Moreover, in this study we did not gather observational data. Several limitations of self-reported measures must be acknowledged. Borg (2006) points at the potential problems of self-reported data in studying teachers: e.g. teachers' responses may be influenced by social desirability, statements are defined by researchers and may not cover the full range of beliefs respondents have, self-reported measures cannot be used to make definite claims about what teachers do in the classroom, etc. It is therefore recommended that observational and other qualitative data are gathered in future research to verify the relationship between reported measures and observed teaching practices. Finally, the question as to how the didactic behaviour of teacher educators influences the learning process of student teachers in relation to CL (Grossman 2005) was not addressed in this study.

The present study supported the findings of Lopata, Miller, and Miller (2003) and Joyce and Showers (1984), in that professional development activities were found to have a significant impact on teachers' skills and the degree to which they implement innovative teaching strategies in practice. Future studies should consider using a design-based research strategy (Collins, Joseph, and Bielaczyc 2004) by training both student teachers and teacher educators in CL and recording observational data in combination with self-report data on competency development. The results of the present study indicate that, in terms of their own learning processes, student teachers score the mental model 'cooperative learning' rather low. However, previous research emphasises the importance of collaboration among teachers for the implementation of innovative teaching strategies to be successful (Goker 2006; Shachar and Shmuelevitz

1997; Showers 1985; Showers and Joyce 1996). The initiation of collaboration among student teachers appears to be related to an improved use of the proposed innovation in practice, i.e. the new teaching strategy tends to be used more frequently and with greater competence (Thijs and van den Berg 2002). Future research should also investigate whether a higher implementation degree of CL also influences the learning preferences of students.

Conclusion

Former studies indicated that teachers' pedagogical behaviour is an important factor in making CL effective, which emphasises the crucial role of teacher education. Other research also pointed at the reluctance of teachers to implement this teaching strategy in educational practice. In this respect, the present study was set up to explore important variables in the innovative professional behaviour of student teachers and teacher educators, such as beliefs/conceptions and self-efficacy in relation to CL. Further, the aim of this study was to investigate the degree of implementation of CL as a teaching strategy in teacher education.

The results of the study contribute to the field as an explorative analysis of the current state-of-the-art in pre-service teacher education and as an important starting point for further empirical and design-based research. Both the moderate feeling of self-efficacy in the implementation of CL, and the finding that student teachers do not value CL as much as other learning strategies for their own learning, can be seen in relation to the reluctance of teachers to implement CL. In combination with a limited attention towards familiarising student teachers with the pedagogical use of CL in primary school classes, some critical problems regarding CL in teacher education appeared in this study. The results appeal to teacher education for more training and practicing opportunities regarding CL. Design-based research can investigate the impact of the related pedagogical development making use of more objective behavioural measures, supplementary to self-report data.

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References

Abrami, P., C. Poulsen, and B. Chambers. 2004. Teacher motivation to implement an educational innovation: Factors differentiating users and non-users of cooperative learning. *Educational Psychology* 24: 201–16.

Angelides, P., T. Stylianou, and J. Leigh. 2007. The efficacy of collaborative networks in preparing teachers. *European Journal of Teacher Education* 30: 135–49.
Antil, L., R. Jenkins, and S. Wayne. 1998. Cooperative learning: Prevalence, conceptualizations, and the relation between research and practice. *American Educational Research Journal* 35: 419–54.
Baines, E., P. Blatchford, and P. Kutnick. 2003. Changes in grouping practices over primary and secondary school. *International Jounal of Edcational Research* 39: 9–34.
Billiet, J. 1991. Research on question wording effects in survey interviews. *Graduate Management Research* 5: 66–80.
Borg, S. 2006. *Teacher cognition and language education: Research and practice.* London: Continuum.
Bouas, J. 1996. Are we giving cooperative learning enough attention in preservice teacher education? *Teacher Education Quarterly* 23: 45–58.
Brody, C., and N. Davidson. 1998. *Professional development for cooperative learning: Issues and approaches.* New York: SUNY Press.
Bruffee, K.A. 1995. Sharing our toys: Cooperative learning versus collaborative learning. *Change* 27: 12–8.
Carlson, H. 1999. From practice to theory: A social constructivist approach to teacher education. *Teachers and Teaching* 5: 203–18.
Cohen, E., C. Brody, and M. Sapon-Shevin. 2004. *Teaching cooperative learning: The challenge for teacher education.* New York: SUNY Press.
Collins, A., D. Joseph, and K. Bielaczyc. 2004. Design research: Theoretical and methodological issues. *Journal of the Learning Sciences* 13: 15–42.
Curtis, D.D., and M.J. Lawson. 2001. Exploring collaborative online learning. *Journal of Asynchronous Learning Networks* 5: 21–34.
Darling-Hammond, L., and K. Hammerness. 2005. The design of teacher education programs. In *Preparing teachers for a changing world: What teachers should learn and be able to do*, ed. L. Darling-Hammond and J. Bransford, 390–441. San Francisco, CA: Jossey-Bass.
de Kock, A., P. Sleegers, and M. Voeten. 2005. New learning and choices of secondary school teachers when arranging learning environments. *Teaching and Teacher Education* 21: 799–816.
De Wever, B. 2006. The impact of structuring tools on knowledge construction in asynchronous discussion groups. Unpublished PhD diss., Ghent University.
Dillenbourg, P. 1999. What do you mean by "collaborative learning"? In *Collaborative-learning: Cognitive and computational approaches*, ed. P. Dillenbourg, 1–15. Amsterdam: Pergamon.
Donche, V., J. Vanhoof, and P. Van Petegem. 2003. Beliefs about learning environments: How do student teachers think, reflect and act concerning self regulated and cooperative learning in Flanders (Belgium)? Paper presented at the AERA annual meeting, April 21–25, in Chicago.
Donche, V., and P. Van Petegem. 2007. Assessing teachers' beliefs and practices in teacher education. *Education-line.* http://www.leeds.ac.uk/educol/documents/166729.htm
Eley, M.G. 2006. Teachers' conceptions of teaching, and the making of specific decisions in planning to teach. *Higher Education* 51: 191–214.
Fullan, M. 2001. *The new meaning of educational change.* 3rd ed. New York: Teachers College Press.
Geddis, A., and E. Wood. 1997. Transforming subject matter and managing dilemmas: A case study in teacher education. *Teaching and Teacher Education* 13: 611–26.
Ghaith, G., and H. Yaghi. 1997. Relationships among experience, teacher efficacy, and attitudes toward the implementation of instructional innovation. *Teaching and Teacher Education* 13: 451–8.
Gillies, R. 2004. The effects of cooperative learning on junior high school students during small group learning. *Learning and Instruction* 14: 197–213.
Gillies, R. 2006. Teachers' and students' verbal behaviours during cooperative and small-group learning. *British Journal of Educational Psychology* 76: 271–87.
Gillies, R., and M. Boyle. 2008. Teachers' discourse during cooperative learning and their perceptions of this pedagogical practice. *Teaching and Teacher Education* 24: 1333–48.
Glass, R., and J. Putnam. 1989. Cooperative learning in teacher education: A case study. *Action in Teacher Education* 10: 47–52.

Goker, S.D. 2006. Impact of peer coaching on self-efficacy and instructional skills in TEFL teacher education. *System* 34: 239–54.
Grossman, P. 2005. Research on pedagogical approaches in teacher education. In *Studying teacher education: The report of the AERA panel on research and teacher education*, ed. M. Cochran-Smith and K.M. Zeichner, 425–52. London: Lawrence Erlbaum.
Guskey, R. 1986. Staff development and the process of teacher change. *Educational Researcher* 15: 5–12.
Guskey, R. 1988. Teacher efficacy, self-concept, and attitudes toward the implementation of instructional innovation. *Teaching and Teacher Education* 4: 63–9.
Guskey, R. 1989. Attitude and perceptual change in teachers. *International Journal of Educational Research* 13: 439–53.
Hammerness, K. 2005. How teachers learn and develop. In *Preparing teachers for a changing world: What teachers should learn and be able to do*, ed. L. Darling-Hammond and J. Bransford, 358–89. San Francisco, CA: Jossey-Bass.
Hermans, R., J. van Braak, and H. Van Keer. 2008. Development of the beliefs of primary education scale: Distinguishing a developmental and transmissive dimension. *Teaching and Teacher Education* 24: 127–39.
Hoogeveen, P., and J. Winkels. 1996. *Het didactische werkvormenboek: Variatie en differentiatie in de praktijk* [The book of instructional strategies: Variation and differentiation in practice]. Assen: van Gorcum.
Hornby, G. 2009. The effectiveness of cooperative learning with trainee teachers. *Journal of Education for Teaching* 35: 161–8.
Ishler, A., R. Johnson, and D. Johnson. 1998. Long-term effectiveness of a statewide staff development program on cooperative learning. *Teaching and Teacher Education* 14: 273–81.
Johnson, D., R. Johnson, L. Buckman, and P.S. Richards. 2001. The effect of prolonged implementation of cooperative learning on social support within the classroom. *Journal of Psychology* 119: 405–11.
Joyce, B., and B. Showers. 1984. *Student achievement trough staff development.* New York: Longman Press.
Kirschner, P.A. 2001. Using integrated electronic environments for collaborative teaching/learning. *Research Dialogue in Learning and Instruction* 2: 1–9.
Kirschner, B.W., R. Dickinson, and C. Blosser. 1996. From cooperation to collaboration: The changing culture of a school/university partnership. *Theory into Practice* 35: 205–13.
Krol-Pot, K. 2005. Towards independence: Implementation of cooperative learning in primary schools. Unpublished PhD diss., Radboud Universiteit.
Leach, J., and P. Scott. 2002. Designing and evaluating science teaching sequences: An approach upon the concept of learning demand and a social constructivist perspective on learning. *Studies in Science Education* 38: 115–42.
Leikin, R. 2004. The wholes are greater than the sum of their parts: Employing cooperative learning in mathematics teachers' education. *Journal of Mathematical Behavior* 23: 223–56.
Levin, B. 2000. Putting students at the centre in education reform. *Journal of Educational Change* 1, no. 2: 155–72.
Lopata, C., K. Miller, and R. Miller. 2003. Survey of actual and preferred use of cooperative learning among exemplar teachers. *Journal of Educational Research* 96, no. 4: 232–9.
Loughran, J. 2006. *Developing a pedagogy of teacher education: Understanding teaching and learning about teaching.* London: Routledge.
Lunenberg, M., and F. Korthagen. 2003. Teacher educators and student-directed learning. *Teaching and Teacher Education* 19: 29–44.
Lunenberg, M., and F. Korthagen. 2005. Breaking the didactic circle: A study on some aspects of the promotion of student-directed learning by teachers and teacher educators. *European Journal of Teacher Education* 28: 1–22.
Lunenberg, M., and M. Volman. 1999. Active learning: Views and actions of students and teachers in basic education. *Teaching and Teacher Education* 15: 432–45.
MacInnerney, J., and T. Roberts. 2004. Cooperative or collaborative learning? In *Online collaborative learning: Theory and practice*, ed. T. Roberts, 203–14. Hershey, PA: Information Science.

Meirink, J. 2007. Individual teacher learning in a context of collaboration in teams. Unpublished PhD diss., Leiden University.
Meloth, M.S., and P.D. Deering. 1999. The role of the teacher in promoting cognitive processing during collaborative learning. In *Cognitive perspectives on peer learning*, ed. O.M. O'Donnell and A. King, 235–55. Mahwah, NJ: Lawrence Erlbaum.
Millis, B.J., and P.G. Cottell. 1998. *Cooperative learning for higher education faculty.* Phoenix, AZ: Oryx Press.
Murray, K., and R. Macdonald. 1997. The disjunction between lecturers' conceptions of teaching and their claimed educational practice. *Higher Education* 33: 331–49.
Murray, J., and T. Male. 2005. Becoming a teacher: Evidence from the field. *Teaching and Teacher Education* 21: 125–42.
Niemi, H. 2002. Active learning: A cultural change needed in teacher education and schools. *Teaching and Teacher Education* 18: 763–78.
Nunnally, J. 1967. *Psychometric theory.* New York: McGraw-Hill.
Pajares, F. 1997. Current directions in self-efficacy research. In *Advances in motivation and achievement*, ed. M. Maehr and P. Pintrich, 1–49. Greenwich: JAI Press.
Palinscar, A.S. 2002. Designing collaborative learning contexts. *Theory into Practice* 41: 26–32.
Panitz, T. 1996. *A definition of collaborative vs cooperative learning*. http://www.londonmet.ac.uk/deliberations/collaborative-learning/panitz-paper.cfm (accessed July 15, 2009).
Rich, Y. 1990. Ideological impediments to instructional innovation: The case of cooperative learning. *Teaching and Teacher Education* 6: 81–91.
Roelofs, E., J. van der Linden, and G. Erkens. 2000. Leren in dialoog: een discussie over samenwerkend leren in onderwijs en opleiding. [Learning through dialogue: A discussion on collaborative learning in education and training]. In *Leren in dialog*, ed. J. van der Linden and E. Roelofs, 7–34. Groningen: Wolters-Noordhoff.
Rose, M. 2004. Comparing productive online dialogue in two group styles: Cooperative and collaborative. *American Journal of Distance Education* 18: 73–88.
Russell, T. 1997. Teaching teachers: How I teach IS the message. In *Teaching about teaching: Purpose, passion and pedagogy in teacher education*, ed. J. Loughran and T. Russell, 32–47. London: RoutledgeFalmer.
Sachar, H., and H. Shmuelevitz. 1997. Implementing cooperative learning, teacher collaboration and teachers' sense of efficacy in heterogeneous junior high schools. *Contemporary Educational Psychology* 22: 53–72.
Sener, J. 1997. ALN's relations: Current educational trends and concepts and their relation to ALN. *ALN Magazine,* Vol. 1.
Sharan, Y., and S. Sharan. 1987. Training teachers for cooperative learning. *Educational Leadership* 45: 20–5.
Showers, B. 1985. Teachers coaching teachers. *Educational Leadership* 42, no. 7: 43–8.
Showers, B., and B. Joyce. 1996. The evolution of peer coaching. *Educational Leadership* 53, no. 6: 12–6.
Slavin, R. 1996. Research on cooperative learning and achievement: What we know, what we need to know. *Contemporary Educational Psychology* 21: 43–69.
Slavin, R. 1999. Comprehensive approaches to cooperative learning. *Theory into Practice* 38: 74–80.
Slavin, R. 2004. When and why does cooperative learning increase achievement? Theoretical and empirical perspectives. In *The RoutledgeFalmer reader in psychology of education*, ed. H. Daniels and A. Edwards, 271–90. London: Routledge.
Strijbos, J.W., and R.L. Martens. 2001. Group-based learning: Dynamic interaction in groups. In *European perspectives on computer-supported collaborative learning: Proceedings of the first European conference on computer supported collaborative learning*, ed. P. Dillenbourg, A. Eurelings, and K. Hakkarainen, 569–76. Maastricht: University of Maastricht.
Swafford, J. 1998. Teachers supporting teachers through peer coaching. *Support for Learning* 13: 54–8.
Thijs, A., and E. van den Berg. 2002. Peer coaching as part of a professional development program for science teachers in Botswana. *International Journal of Educational Development* 22: 55–68.

Tigchelaar, A., F. Korthagen, T. Wubbels, H. Broekman, L. Galesloot, J. Haenen, O. de Jong, et al. 2001. Praktijkrelevant opleiden, een inleiding [Educating with relevance to practice, an introduction]. In *Leraren opleiden met het oog op de praktijk*, ed. F. Korthagen, A. Tigchelaar, and T. Wubbels, 7–23. Leuven: Garant.

Veenman, S., B. Kenter, and K. Post. 2000. Cooperative learning in Dutch primary schools. *Educational Studies* 26: 281–302.

Veenman, S., N. van Benthum, D. Boosma, J. van Dieren, and N. van der Kemp. 2002. Cooperative learning and teacher education. *Teaching and Teacher Education* 18: 87–103.

Vermunt, J., and F. Van Rijswijk. 1997. *Inventaris Leerstijlen voor het hoger onderwijs* [Learning Styles Inventory for higher education]. Tilburg: Katholieke Universiteit Brabant.

Watters, J., and I. Ginns. 2000. Developing motivation to teach elementary science: Effect of collaborative and authentic learning practices in preservice education. *Journal of Science Teacher Education* 11: 301–21.

Wilhelm, K. 1997. Sometimes kicking and screaming: Language teachers-in-training react to a collaborative learning model. *Modern Language Journal* 81: 527–43.